Claims

[1] A transparent conductive film having a lamination structure that a surface of a metallic thin film is coated with a transparent oxide thin film, wherein the transparent oxide thin film is an amorphous oxide thin film chiefly composed of gallium, indium, and oxygen or composed of gallium and oxygen, and a gallium content of the transparent oxide thin film ranges from 35 at. % to 100 at. % with respect to all metallic atoms.

[2] A transparent conductive film having a three-layer structure that a metallic thin film is sandwiched between transparent oxide thin films, wherein each of the transparent oxide thin films is an amorphous oxide thin film chiefly composed of gallium, indium, and oxygen or composed of gallium and oxygen, and a gallium content of each transparent oxide thin film ranges from 35 at. % to 100 at. % with respect to all metallic atoms.

[3] A transparent conductive film according to claim 1 or 2, wherein the metallic thin film is constructed with a single layer having at least one, as a main component, selected from among metallic elements, such as silver, gold, platinum, palladium, rhodium, iridium, ruthenium, osmium, nickel, copper, and aluminum, or with a laminated layer of at least two kinds of single-layer films of different compositions.

[4] A transparent conductive film according to claim 3, wherein the metallic thin film is a silver alloy that contains silver as a main component and has a gold content ranging from 0.1 at. % from 4.0 at. %.

[5] A transparent conductive film according to claim 4, wherein the metallic thin film is a silver alloy that contains silver as a main component and has a gold content ranging from 0.1 at. % from 2.5 at. % and a copper content ranging from 0.1 at. % to 1.0 at. %.

[6] A transparent conductive film according to claim 3, wherein the metallic thin film is a

lamination film of nickel and gold.

[7] A transparent conductive film according to any one of claims 1-6, wherein the metallic thin film ranges in thickness from 1 nm to 20 nm.

[8] A transparent conductive film according to claim 7, wherein the metallic thin film ranges in thickness from 5 nm to 20 nm.

[9] A transparent conductive film according to claim 2, wherein the metallic thin film ranges in thickness from 1 nm to 20 nm and contains one selected from among metallic elements such as silver, gold, platinum, palladium, rhodium, iridium, ruthenium, and osmium, a content of a selected metallic element being 96 at. % or more.

[10] A transparent conductive film according to claim 9, wherein the metallic thin film is a silver alloy that has a gold content ranging from 0.1 at. % to 4.0 at. %.

[11] A transparent conductive film according to claim 9, wherein the metallic thin film is a silver alloy that has a gold content ranging from 0.1 at. % to 2.5 at. % and a copper content ranging from 0.1 at. % to 1.0 at. %.

[12] A transparent conductive film according to any one of claims 1-11, wherein a transmittance of light with a wavelength of 380 nm in a film itself is more than 80 %.

[13] A transparent conductive film according to any one of claims 1-12, wherein a transmittance of light with a wavelength of 320 nm in a film itself is more than 62 %.

[14] A transparent conductive film according to any one of claims 1-13, wherein a transmittance of light with a wavelength of 300 nm in a film itself is more than 56 %.

[15] A transparent conductive film according to any one of claims 1-14, wherein a surface resistance is less than 20 Ω / □.

[16] A transparent conductive base material comprising a transparent conductive film according to any one of claims 1-15, formed on one or each surface of a transparent substrate of one selected from materials such as a glass plate, a quartz plate, a resin plate or resin film, one or each surface of which is coated with a gas barrier film, and a resin plate or resin film into which the gas barrier film is inserted.

[17] A transparent conductive base material according to claim 16, wherein the gas barrier film is at least one selected from among films such as a silicon oxide film, a silicon oxide-nitride film, a magnesium aluminate film, a tin oxide-based film, and a diamond-like carbon film.

[18] A transparent conductive base material according to claim 16, wherein the resin plate or the resin film is formed of polyethylene terephthalate (PET), polyether sulfone (PES), polyarylate (PAR), polycarbonate (PC), or polyethylene naphthalate (PEN), or has a lamination structure that a surface of such a substance is coated with acrylic-based organic matter.

[19] A transparent conductive base material according to any one of claims 16-18, wherein a transmittance of light with a wavelength of 380 nm is more than 70 %.

[20] A transparent conductive base material according to any one of claims 16-19, wherein a transmittance of light with a wavelength of 320 nm is more than 65 %.

[21] In the transparent conductive base material according to any one of claims 16-20, wherein a transmittance of light with a wavelength of 300 nm is more than 60 %.

[22] A transparent conductive base material according to any one of claims 16-21, wherein a surface resistance is less than 20 Ω / □.

[23] A method of fabricating the transparent conductive film in which the amorphous oxide thin film used for the transparent conductive film having the lamination structure according to claim 1 or 2 is formed in such a way that an oxide sintered body chiefly composed of gallium and indium and having a gallium content ranging from 35 at. % to 100 at. % with respect to all metallic atoms is used as raw material, a mixed gas of argon and oxygen is used as a sputter gas for gas pressure through the sputtering process, a total gas pressure is set to 0.2-0.8 Pa, and an oxygen content is set to 0-5.5 %.

[24] A light-emitting device in which a transparent conductive film according to any one of claims 1-15 is used for a transparent electrode.